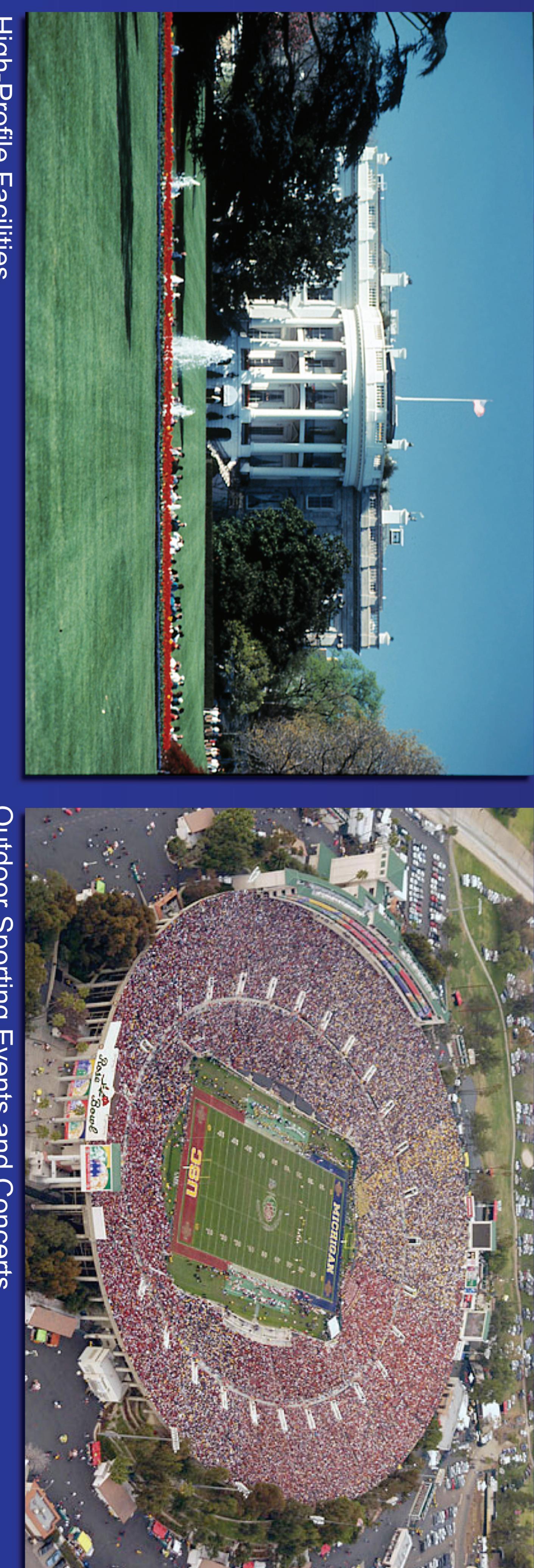


Siting of BioWatch Collectors for High-Profile Facilities and Special Events – QUIC Collector Siting Around Buildings & Outdoor Stadiums

Problem Space



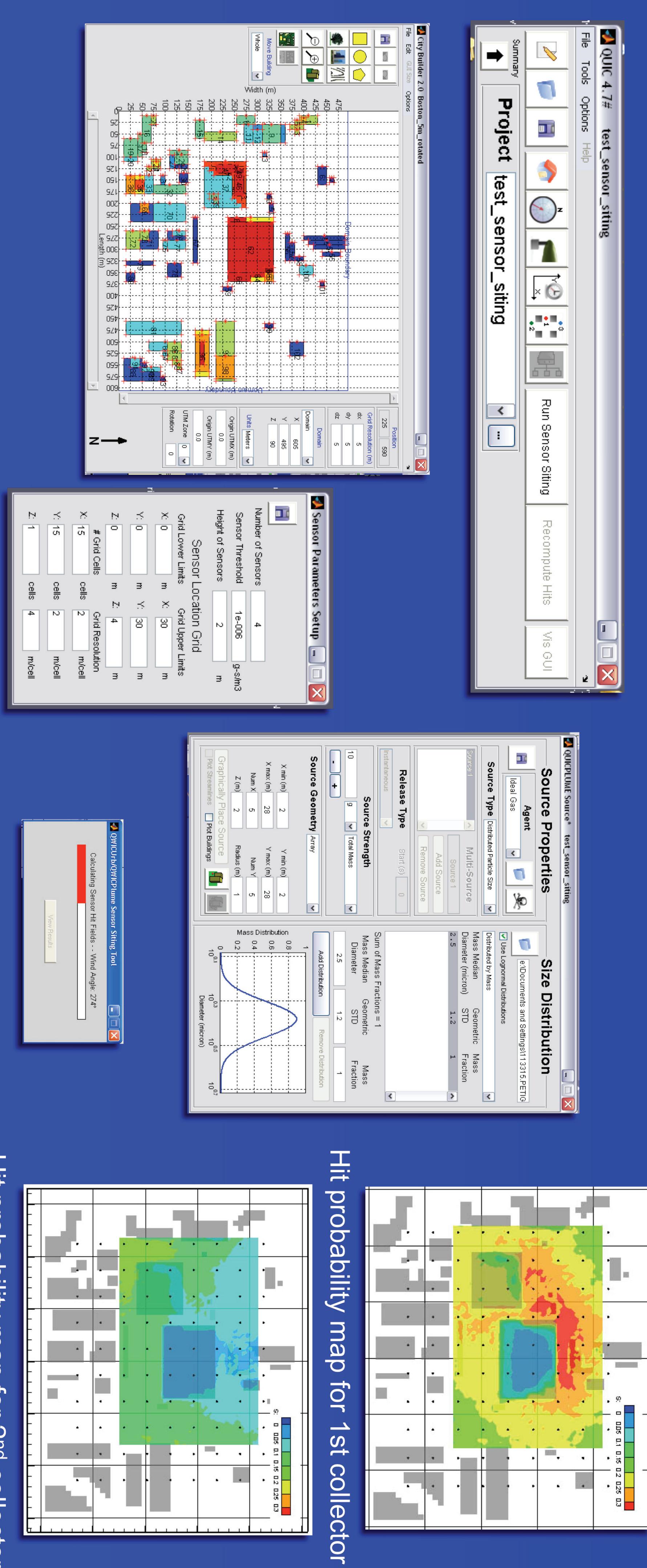
High-Profile Facilities

Outdoor Sporting Events and Concerts

Festivals

Parades

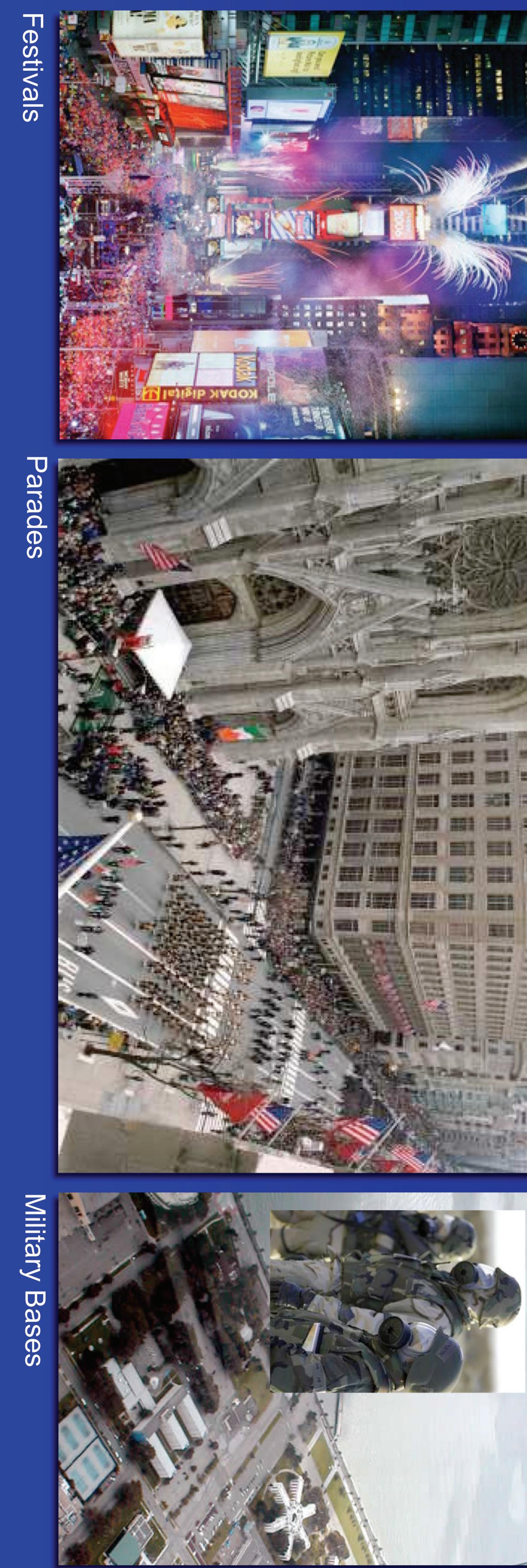
Military Bases



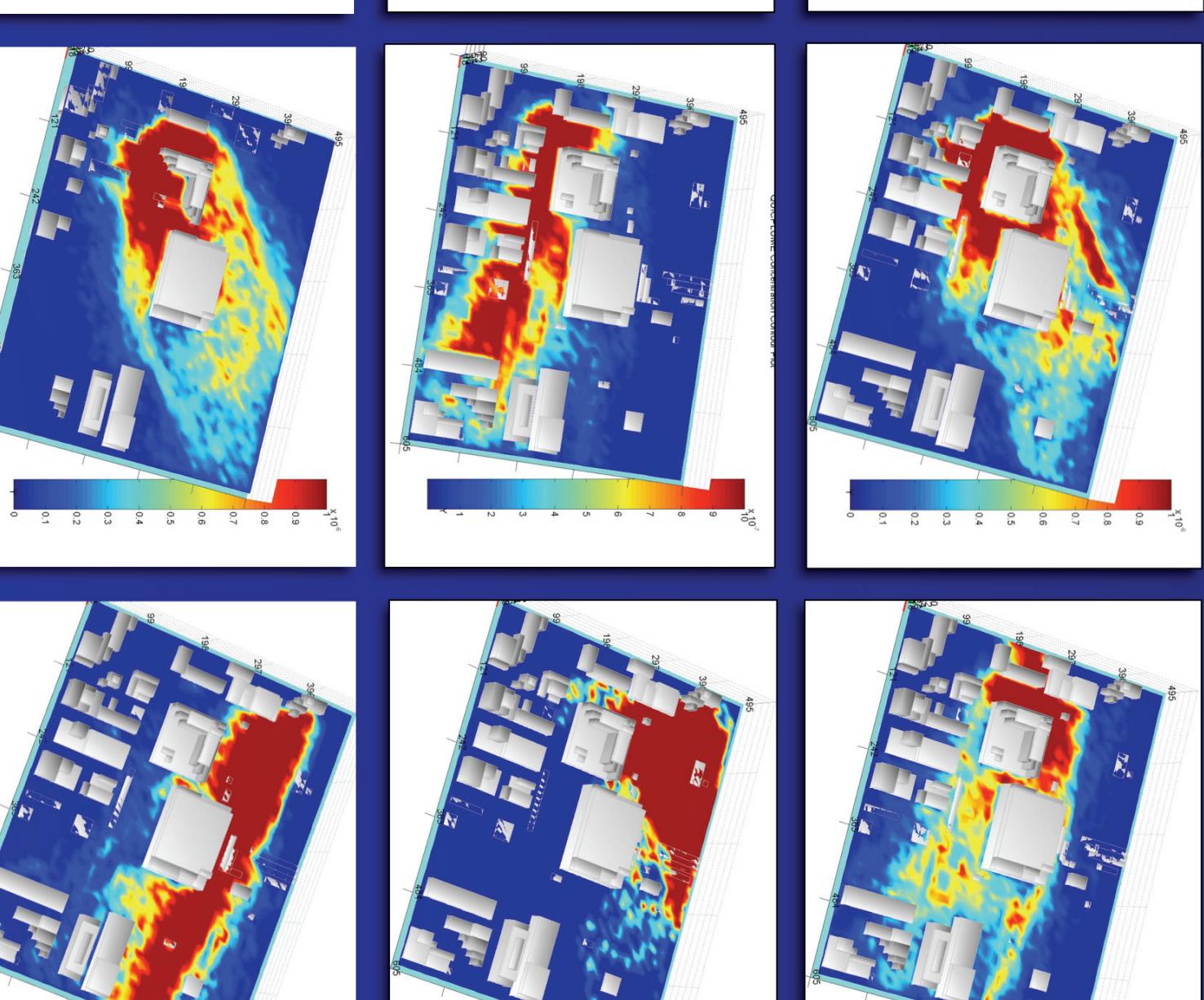
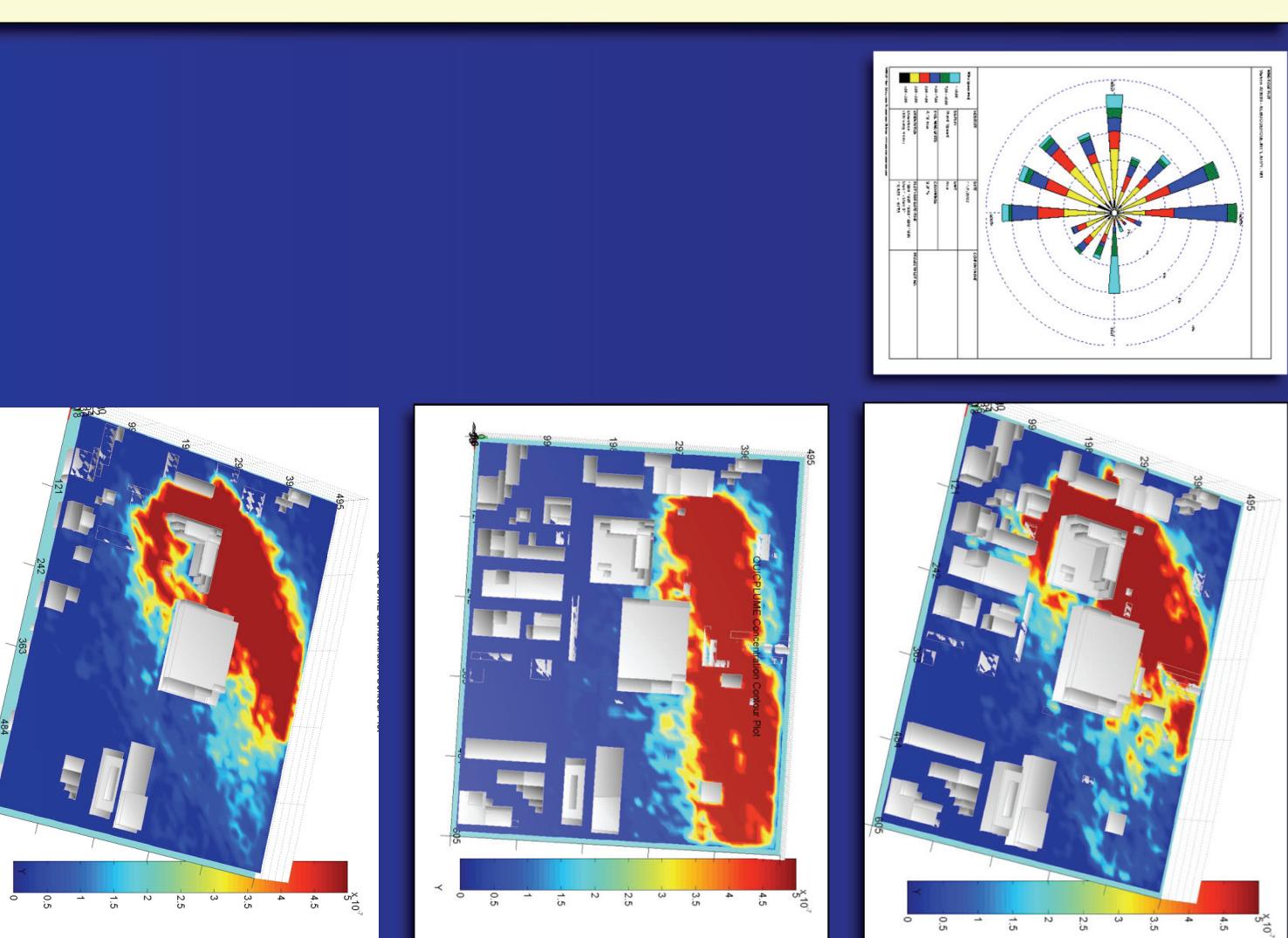
Hit probability map for 2nd collector

The Tool and the Product

BioWatch collectors are being put out in the field to protect high-profile facilities and during special events where there are large crowds. The question often arises about where are the best places to put the collectors. Is a street corner a good idea? In between two tall buildings? On the rooftop? Near trees? We have developed an automated modeling tool to answer where the best locations are to site collectors in cities, at outdoor stadiums, and around building complexes.



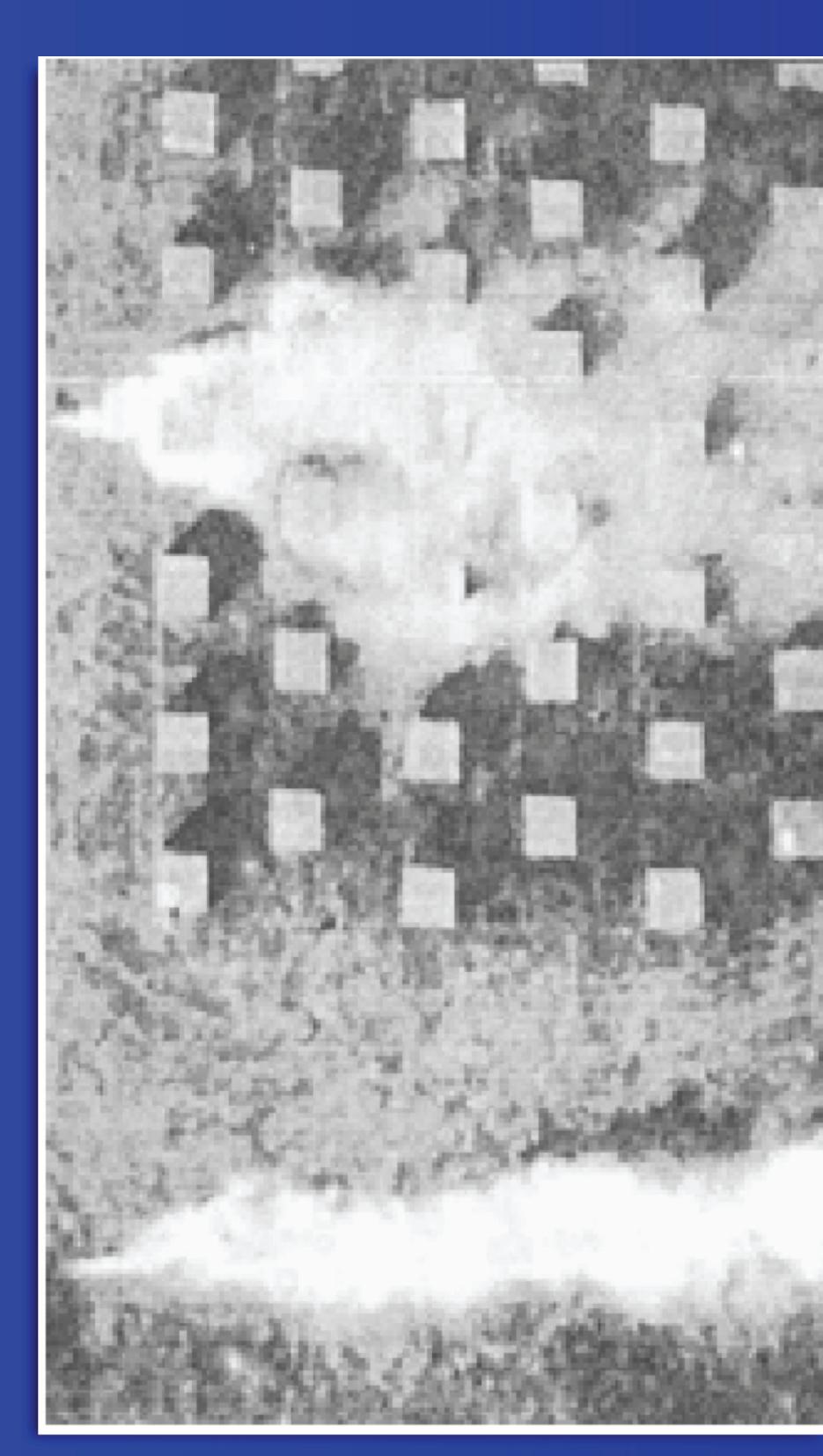
Thousands of plume calculations are performed for winds from all direction and releases at hundreds of locations. Using local wind climatology, the plume dosage contours are weighted by the wind frequency and summed up to give a map showing the percentage of time a collector would register a hit for a given release size. Running thousands of simulations in a day or less is only possible due to the fast tuning of the Quick-Urb & Industrial Complex (QUIC) dispersion modeling system.



QUIC is comprised of:
 * QUIC-URB produces 3D wind field around buildings using an empirical/diagnostic model
 * QUIC-PLOME accounts for building-induced turbulence through Lagrangian random-walk dispersion model
 * QUIC-GUI graphical user interface for set-up, running, visualization, and post-processing

Methodology

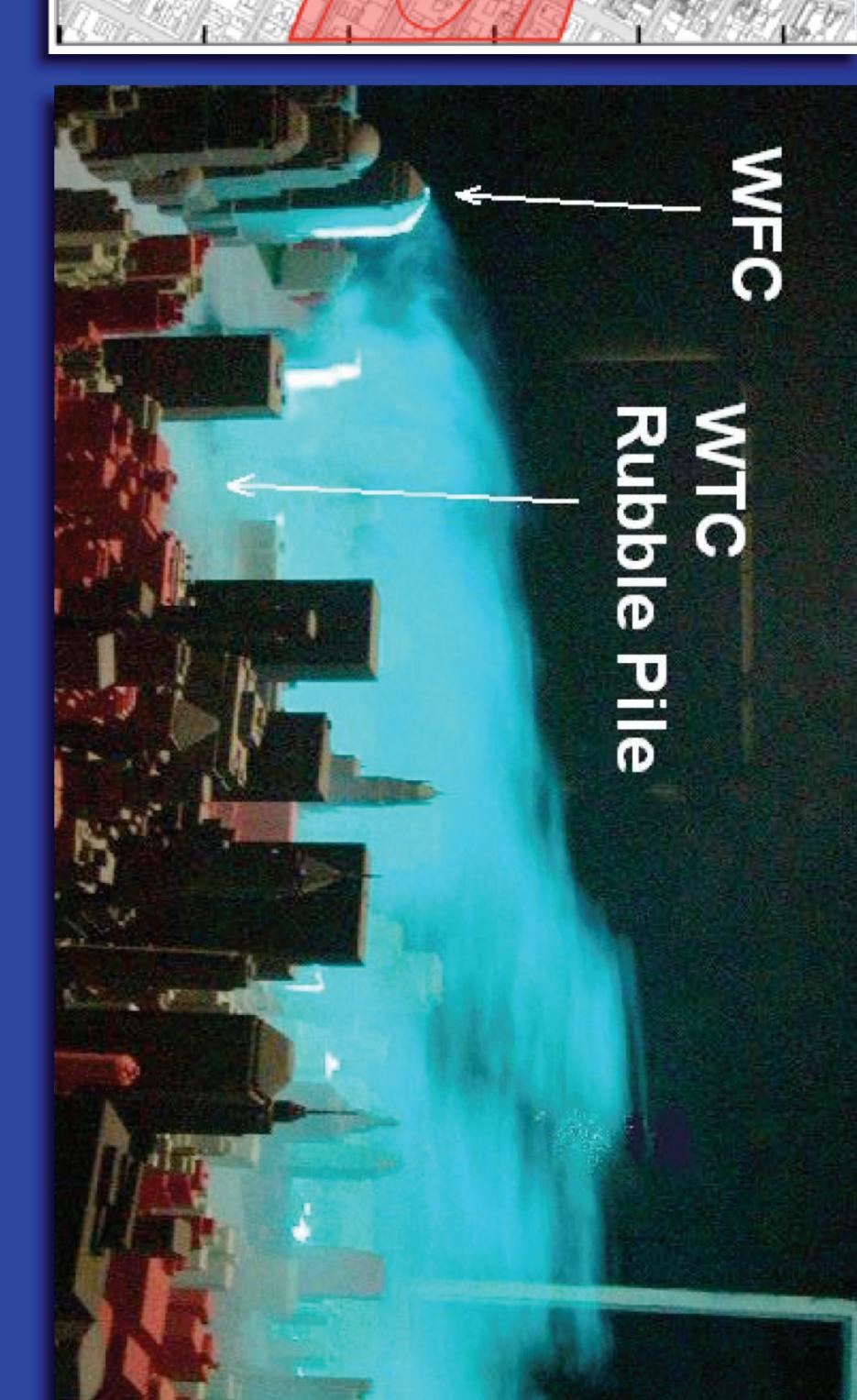
Why Account for Buildings?



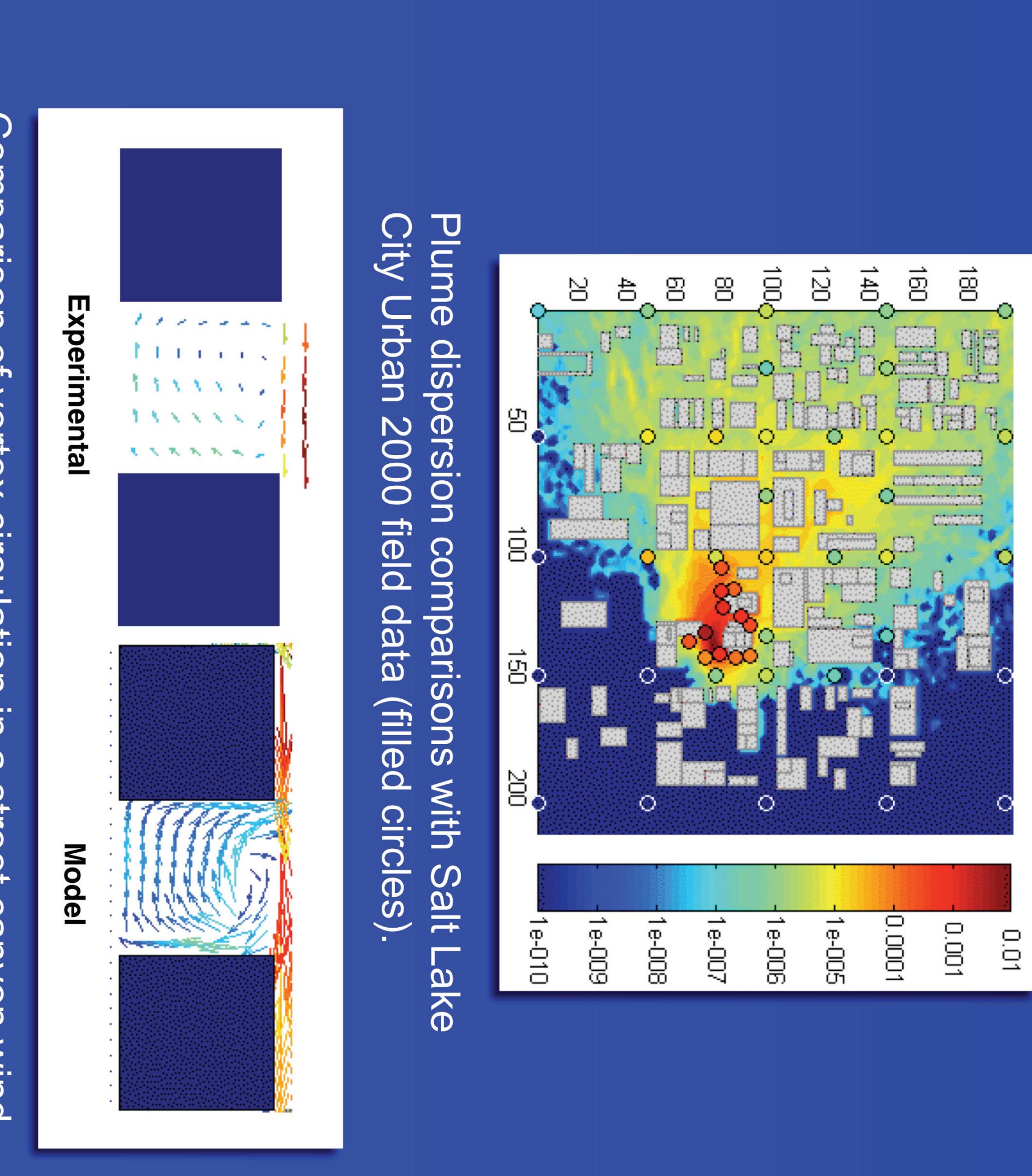
Buildings can enhance lateral spread. Plan view of smoke dispersing over flat terrain (right) and going through an array of buildings (left). USEPA wind tunnel experiment.



Simultaneous tracer releases located one block apart in New York City. In one case the plume spread was large and in the other case small. Non-building-aware dispersion models cannot distinguish between the two cases. Courtesy of J. Allwine, PNNL.



Rad and Chem Sensor Siting?

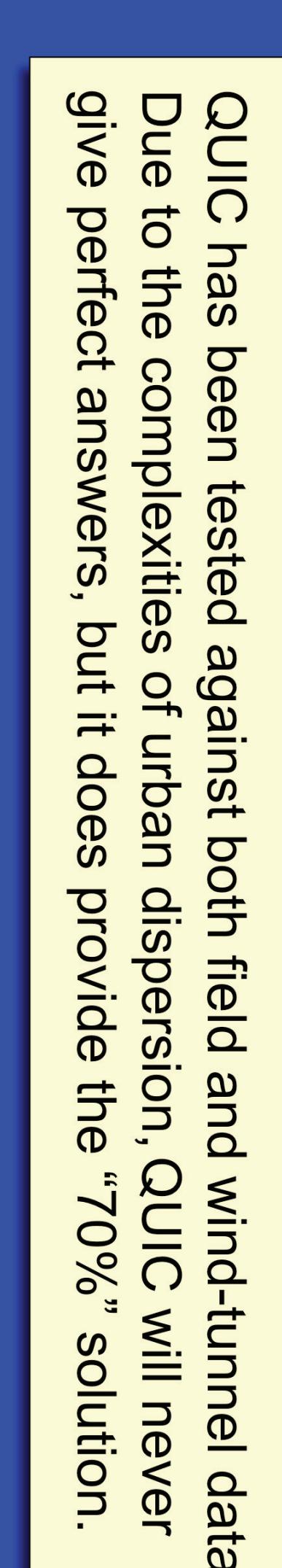


Experimental

Model

Comparison of vortex circulation in a street canyon wind-tunnel experiment.

The QUIC Collector Siting Tool produces maps showing the best (and worst) places to put biological collectors around a building complex based on probability of detection. The tool has been used for the Democratic and Republican National Conventions, the Rose Bowl, the G-8 summit, and other special events. The graphical user interface allows for the user to easily set-up building layouts, denote regions of trees, specify the wind climatology, choose the biological agent type, specify collector sampling properties, and pick areas where collectors can be sited. A reachback team is available at LANL for performing calculations; siting requests should be placed through DHS.



Plume dispersion comparisons with Salt Lake City Urban 2000 field data (filled circles).

Experimental

Model

Comparison of vortex circulation in a street canyon wind-tunnel experiment.

QUIC has been tested against both field and wind-tunnel data.

Due to the complexities of urban dispersion, QUIC will never give perfect answers, but it does provide the "70%" solution.

Dispersion calculations for a radiological dispersal device. The model accounts for explosive buoyant rise and particle gravitational settling.

QUIC handles dense gas dispersion and explosive multi-particle size releases ("dirty" bombs). The QUIC Collector Siting Tool can be adapted to site chemical and radiological sensors.